





The Forty-Fifth Annual Report  
OF THE  
UNIVERSITY OF MARYLAND  
Agricultural Experiment Station



College Park, Prince George County, Maryland

1931-1932

PUBLISHED BY THE STATION

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Arthur B. Hamilton, M.S., Assistant.  
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#### AGRONOMY (CROPS AND SOILS).

† J. E. Metzger, B.S., A.M., Agronomist.  
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O. C. Bruce, M.S., Asso. Soil Technologist.  
R. P. Thomas, Ph.D., Soil Technologist.  
E. H. Schmidt, M.S., Assistant (Soils).  
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R. L. Sellman, B.S., Assistant.

#### BOTANY, PATHOLOGY, PHYSIOLOGY

†† C. O. Appleman, Ph.D., Physiologist.  
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Ronald Bamford, Ph.D., Assoc. Botanist.  
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M. W. Parker, Ph.D., Assistant Physiologist.

#### ENTOMOLOGY.

E. N. Cory, Ph.D., Entomologist.  
H. S. McConnell, B.S., Associate.  
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L. P. Dittman, Ph.D., Assistant.  
Geo. Abrams, M.S. Assistant (Bees).  
C. Graham, M.S., Assistant.

#### ANIMAL AND DAIRY HUSBANDRY.

DeVoe Meade, Ph.D., Dairy and Animal  
Husbandman.  
B. E. Carmichael, M.S., Animal Husbandman.  
W. E. Hunt, M.S., Associate, Animal  
Husbandry.  
L. W. Ingham, M.S., Associate (Dairy  
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R. C. Munkwitz, M.S., Associate (Dairy  
Manufacturing).  
M. H. Berry, M.S., Assistant Dairy  
Husbandry.  
H. L. Ayres, Dairy Mfg.  
W. C. Supplee, Ph.D., Assistant (Meat  
Curing).

#### HOME ECONOMICS

Margaret Coffin, M.A.

#### HORTICULTURE.

J. H. Beaumont, Ph.D., Horticulturist.  
T. H. White, M.S., Olericulturist and  
Floriculturist.  
A. L. Schrader, Ph.D., Pomologist.  
S. W. Wentworth, M. S., Associate Pomologist.  
\* F. E. Gardner, Ph.D., Pomologist (Plant  
Propagation).  
H. E. Cordner, Ph.D., Assistant Olericulturist.  
W. A. Matthews, M.S., Assistant, Canning  
Crops.  
Paul Marth, B.S., Assistant, Pomology.

#### ANIMAL PATHOLOGY AND BACTERIOLOGY.

E. M. Pickens, A.M., D.V.M., Animal  
Pathologist.  
R. C. Reed, Ph.B., D.V.M., Pathologist.  
\*\* A. L. Brueckner, B.S., D.V.M., Associate  
Pathologist.  
L. J. Poelma, D.V.M., M.S., Assistant.  
H. M. Devolt, D.V.M., Assistant (Poultry  
Diseases).  
C. L. Everson, D.V.M., Assistant.

#### POULTRY HUSBANDRY.

R. H. Waite, B.S., Poultry Husbandman.  
Geo. D. Quigley, B.S., Associate.

#### RIDGELY SUB-STATION.

Albert White, B.S., Superintendent.

#### SEED INSPECTION.

F. S. Holmes, B.S., Inspector.  
Ellen Emack, Assistant Analyst.  
Ruth M. Shank, Assistant Analyst.  
O. M. Farber, B.S., Assistant Analyst.  
Olive Kelk, Assistant Analyst.  
Elizabeth Shank, Assistant.

\* Agent U. S. Department of Agriculture.

† Assistant Director.

\*\* Live Stock Sanitary Laboratory.

†† Dean of Graduate School.

The Station is located on the B. & O. R. R., City and Suburban Electric Car  
Line and the Baltimore-Washington Boulevard, eight miles north of  
Washington, D. C. Bell Telephone—Berwyn Exchange.

Visitors will be welcome at all times, and will be given every opportunity  
to inspect the work of the Station in all its departments.

The Bulletins and Reports of the Station will be mailed free of charge,  
to all residents of the State who request them.

#### ADDRESS:

AGRICULTURAL EXPERIMENT STATION,  
COLLEGE PARK, MARYLAND.



# UNIVERSITY OF MARYLAND

## AGRICULTURAL EXPERIMENT STATION

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Volume 45

1931-32

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### THE FORTY-FIFTH ANNUAL REPORT OF THE MARYLAND AGRICULTURAL EXPERIMENT STATION

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For Fiscal Year Ending June 30, 1932

By H. J. PATTERSON, Director

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*To the Governor of Maryland, the Board of Regents, and the President of the University of Maryland:*

Gentlemen: By direction of the Federal and State Acts there is presented herewith a statement as to the work and activities together with a financial statement as to the receipts and expenditures of the Maryland Agricultural Experiment Station for the fiscal year ending June 30, 1932. There is also appended the bulletins, giving the results of investigations, issued during the year.

Fruitful research is usually the result of months and even years of patient toil. This fact should not however develop the attitude that worthwhile results can not be procured in a short time. Research workers should guard against the evils of a certain kind of lethargy, conservatism, and contentment that prevents putting as much push into the prosecution of projects as their character and importance would make possible and desirable. It is very important that research projects be kept tabulated up-to-date and results reported promptly.

#### FACILITIES AND EQUIPMENT

The statements made in the 44th annual report as to the needs of land, building, greenhouses, and equipment for research work and also for some phases of educational work, still holds. In some respects the need becomes more acute each year.

## PUBLICATIONS

The following is a list of the bulletins and technical papers published during the year:

BULLETINS				
Bulletin Number	Subject	Author	Pages	Copies Issued
329	Corn Silage Production	J. E. Metzger and R. L. Sellman	1-12	5000
330	Calf Feeding	M. H. Berry	13-30	2500
331	Contagious Abortion in Experiment Station Dairy Herd	L. W. Ingham and DeVoe Meade	31-42	2500
332	Oat Feed Roughage	M. H. Berry	43-48	2500
333	Fertilization of Early Potatoes	J. E. Metzger and E. H. Schmidt	49-62	5000
334	The Poultry House Floor	R. H. Waite	63-78	2500
335	The Vegetative Propagation of Plants	F. E. Gardner	79-111	2500
336	Feeding Wheat to Fattening Hogs	B. E. Carmichael	112-154	2500
	44th Annual Report	H. J. Patterson	I-XXVIII	1000

## TECHNICAL PAPERS

- Aldrich, W. W.—Nitrogen Intake and Translocation in Apple Trees Following Fall, Winter and Spring Sodium Nitrate Applications. A. S. H. S., 1931.
- Berry, M. H.—The Use of Skim Milk Powder in Grain Rations for Dairy Calves. *Journal Dairy Science*, July, 1932.
- Berry, M. H.—The Use of Dried Blood Flour in Raising Dairy Calves. *Maryland Farmer*, April, 1932.
- Berry, M. H.—The Development of an Electric Sterilizer for Dairy Equipment. *American Dairy Science Association*, Sept., 1931.
- Cory, E. N.—A Summary of the Corn Ear Work in Maryland. *Canning Trade*, May 23, 1932.
- Cory, E. N.—Codling Moth Studies. *Bulletin of the State Board of Agriculture*, Dover, Delaware, Vol. 21, No. 5, 1931.
- Cory, E. N. and P. D. Sanders—Tests Against the Overwintering Stage of the Codling Moth. *Journal of Economic Entomology*, Vol. 25, No. 3, June, 1932.
- DeVault, S. H., W. P. Walker and D. G. Harry—Progress Report of the Tax Study, 1931; Annual Report of Maryland State Grange, 1931.
- DeVault, S. H. and A. B. Hamilton—Agricultural Statistics for Maryland, by Counties (mimeographed).
- DeVault, S. H. and A. B. Hamilton—Economic Efficiency of the Farm Layout (mimeographed).
- DeVault, S. H. and Ralph Russell—Outlook for Maryland Agriculture, 1932 (mimeographed).
- DeVault, S. H.—Factors Influencing Profits on Maryland Truck Farms; Annual Report of Vegetable Growers Association, 1931.
- DeVault, S. H.—Content of the Course in Cooperative Marketing; Annual Report of the National Association of Marketing Officials, 1931.
- Ditman, L. P.—The Infestation of the Corn Ear by *Chloridea Obsoleta* Fab. in Regard to Time of Silking. *Journal of Economic Entomology*, Vol. 25, No. 3, June, 1932.
- Fisher, R. A.—A Seasonal Phosphate Fixation and Availability Study on Leonardtown Silt Loam. *Scientific Agriculture*.

- Hamilton, A. B.—What Is Ahead for Agriculture, Aegis Paper, Bel Air, Maryland, September 10, 1931.
- Hamilton, A. B.—Laying Out the Farm, Aegis Paper, Bel Air, Maryland, March 18, 1931.
- Kemp, W. B.—The Present Status of Corn Breeding. Report of Maryland Agricultural Society.
- Kemp, W. B.—Specialization in Agriculture in Land Grant Colleges. The Proceedings of Association of Land Grant Colleges.
- Langford, G. S. and E. N. Cory—Observations on the Potato Tuber Moth. Journal of Economic Entomology, Vol. 25, No. 3, June, 1932.
- Langford, G. S.—Some Important Truck Crop Pests. Bulletin of the State Board of Agriculture, Dover, Delaware, Vol. 21, No. 5, 1931.
- Metzger, J. E.—Fertilizer Recommendations Under the New State Law. Report of Maryland Agricultural Society.
- McConnell, H. S.—Parasitism and Over Winter Control on Peach Moth. Bulletin of the State Board of Agriculture, Dover, Delaware, Vol. 21, No. 5, 1931.
- Rothgeb, R. G.—The Use of Crop Land in Maryland. The Report of Maryland Agricultural Society.
- Schrader, A. L.—Further Studies on the Effect of Fruiting on the Shoot Growth of the Concord Grape. A. S. H. S., 1931.
- Schrader, A. L.—Fertilization of Strawberries in Maryland. Published in Maryland, Delaware Hort. Society, 1931.
- Schrader, A. L.—The Effect of Nitrogen Potassium and Phosphorus on the Keeping and Shipping Quality of Fruit. Maryland State Hort. Society, 1931.
- Schrader, A. L. and Paul Marth—Light Intensity as a Factor in the Development of Apple Growth and Size. A. S. H. S., 1931.
- Thomas, R. P.—Broadcast vs. Hill Fertilizer. The Report of Maryland Agricultural Society.
- Anzulovic, J. V.—A Study of *Escherchia Coli* in Ice Cream. The Proceedings of 1931 Annual Meeting of American Bacteriological Association, December, 1931.
- Bartram, M. T.—The Effect of Pasteurization Temperatures on (a) *Brucella abortus*; and (b) *Brucella abortus* Agglutinins in Milk. The Cornell Veterinarian, Vol. XXI, Oct., 1931, p. 360.
- DeVolt, H. M. and C. R. Davis—Pullorum Disease in Chickens. Published as a Bulletin.
- DeVolt, H. M. and C. R. Davis—A Cholera-like Disease in Turkeys. The Cornell Veterinarian, Vol. XXII, Jan., 1932, p. 78.
- Everson, C. L., L. J. Poelma, E. L. Brueckner and E. M. Pickens—The Portals of Entry of *Brucella Abortus* in Guinea Pigs: This paper to be read before the American Public Health Association, in Washington, in October.
- Malcolm—The Efficiency of Certain Germicides in the Preparation of Biologic Products. Journal of Bacteriology, Vol. XXII, Dec., 1931, p. 403.
- Poelma, L. J. and E. M. Pickens—*Brucella abortus* in Human Tonsils: The Proceedings of the 1931 Annual Meeting of the American Bacteriological Association, Dec., 1931.
- Disease in Bob-White Quail. The Maryland Conservationist, Vol. IX, Shillinger, J. E., H. M. DeVolt and E. M. Pickens—An Outbreak of Quail 1932, p. 18.

## CHANGES IN STAFF

## RESIGNATIONS

E. C. Auchter, Ph.D., Horticulturist, resigned to devote all of his time to the position of Horticulturist of the U. S. Department of Agriculture, which he has held for the past four years.

H. E. Besley, M.S., resigned as Assistant in Agricultural Engineering.  
(Mrs. E. S.) Constance C. Degman resigned as Assistant Seed Analyst.

## APPOINTMENTS

J. H. Beaumont, Ph.D., was appointed Horticulturist and Chief of the Department of Horticulture of the University. He took up his duties March 1st, 1932.

F. B. Lincoln, Ph.D., was appointed Associate in Plant Propagation. He came here from the University of California. He began work April 1st, 1932.

## PROGRESS OF RESEARCH

## CONTRIBUTIONS MADE TO FARM INFORMATION

*Agricultural Economics*  
*The Farm Organization:*

The economic conditions which have prevailed during the past three years have caused many farmers to realize the necessity for a business analysis of their farm operations and the adopting of a system of cost accounting. To meet this demand this department has devised a very simple accounting system that requires very little writing.

During the past three years a study has been made of the organization and business analysis of 279 farms in the Piedmont Plateau region and 265 farms on the Eastern Shore. The results are being compiled and details will be given in a bulletin. They emphasize the relation of low unit cost to profit. Low unit cost depended upon efficient organization and operation. The factors which contribute to these are: (1) size of business, (2) combination of crop and annual production, (3) the combination of farm enterprises and the elimination of unprofitable supplementary crops, (4) holding capital investment and permanent improvements as low as possible, (5) cultivate only high producing land intensively and put submarginal lands in permanent pasture or forestry, (6) keep only high producing animals, (7) study the markets available and determine if it is best to market products directly or through animal products, (8) produce as much as possible of the family needs on the farm, (9) maintaining a relatively low hired labor cost.

### *Insurance:*

The business analysis study of Maryland farms, developed that fire insurance premiums for farms on the Eastern Shore represented about one-half percent of all farm expenses and one and one-half percent for the Piedmont Plateau farms.

In the Piedmont Plateau 255 farms had 311 fire insurance policies and 108 automobile insurance policies—79% of the insurance was carried with Mutual Companies.

### *The Farm Layout:*

The study of the layout or plan of 127 farms has shown a very direct relation to the income. The farms with a good layout had an average labor income in 1929 of \$1,753 compared with \$133 for those with a poor layout. One worker on the well laid out farms could care for 10 acres more than on the poor layouts (57 to 47 acres).

### *Cooperative Associations in Maryland:*

This study was made in cooperation with the Federal Farm Board. A survey of the farmer cooperatives in Maryland showed that there were 42 marketing and purchasing associations functioning in 1931. The organizations had a membership of 18,354. The total volume of business was \$22,719,740, distributed as follows: Sales of milk, \$14,882,045; tobacco, \$2,862,588; fruits and vegetables, \$1,103,433; grain, \$503,353; livestock and wool, \$14,143; cooperative purchases, \$2,215,052; cooperative transportation routes, \$1,137,124.

Bulletins will soon be issued giving the results obtained on the following project: The survey made to determine the factors affecting the consumption of milk in Baltimore; the study of Maryland's farm tax problem; farm tenancy in Maryland; and the supply and distribution of Maryland tobacco.

The projects listed in the 44th report will be continued. On the Farm Organization and Business Analysis project, some special supplementary studies will be made on dairy, poultry and turkey farms. Members of the department staff gave 61 addresses at public meetings and have contributed 8 papers to journals and the press. A department library and facilities for keeping charts and maps so that they are easily and quickly accessible would be helpful in increasing the efficiency of teaching and research. More calculating machines, typewriters, and facilities for making graphs, charts, etc., would prove helpful at rush seasons.

The following problems are suggested for investigation:

1. Local County Government.
2. Sociological factors influencing profits on Maryland farms.
3. Consumers' preferences and market demand for specific food products in Baltimore and Washington.
4. Credit problems of Maryland farmers.
5. Land utilization in Maryland—its limitations and efficiency.
6. A survey of the Agricultural Situation in:

- (a) The Hagerstown trade areas
- (b) The Cumberland trade area
- (c) The Baltimore trade area
- (d) The Salisbury trade area

### *Agricultural Engineering*

#### *Electric Dairy Utensil Sterilizer:*

There has been developed an electric dairy utensil sterilizer that is economical in the use of current. It requires a minimum of manipulation by the operator. It gives a dry, well sterilized utensil. A Maryland company plans to produce the sterilizer commercially.

#### *Electric Pasteurizer:*

Good progress has been made on developing an electric pasteurizer which will be adapted to use with a small quantity of milk and to the needs of the small dairyman who has 5 to 10 gallons of milk per day to be pasteurized.

The following problems call for research:

1. Soil erosion.
2. Dairy barn ventilation.
3. Preservative treatments for metal roofs.

This department needs additional space for laboratory.

### *Agronomy (Crops and Soils):*

The crop year of 1931 was above average as to yields, but much below average from the standpoint of values. The average yields per acre for Maryland given by the Crop Reporting Office of the U. S. Department of Agriculture was: Corn, 38 bushels; wheat, 24 bushels; all hays, 1.2 tons; alfalfa, 2.3 tons. The total value of the twenty-two leading crops was estimated at about thirty-two million dollars.

This Station was responsible for the introduction into Maryland of improved varieties and strains of corn and wheat and of alfalfa and soybeans. These have been important factors in the increases in yields noted above.

The most outstanding recent contributions made by the Station are the following: A new higher yielding strain of Mammoth Red Wheat. It is the standard and best variety available for Eastern and Southern Maryland and the valley areas in the Western counties. A new hybrid, smooth awned, Winter Barley; a new hybrid Sweet Corn named "Hopeland" which will produce more canned corn per acre than the varieties usually used. A revised rotation for dairy farms consisting of silage corn, winter barley and alfalfa.

This Station has devised a method for obtaining fairly accurate yields by using only a sample from a small area and also designed a satisfactory machine for threshing single heads and small samples of grains. These methods and facilities are being used by many research workers.

### *Alfalfa:*

In 1929 there was begun a study of the adaptability of alfalfa from various seed producing regions to Maryland conditions. Seed from eleven different sources was secured. All but two of these were purchased directly from either growers or were secured from Experiment Stations. Two lots were of federal verified origin seed. The yield results are given in tabular form. It is interesting to note that there is very little difference between the common alfalfa grown in the semi-humid area and the hardy strains, such as Grimm and Variegated. None of the seeds from southern sources did well. The low yield of the first year may be due in part to the usual high percentage of hard seed coats.

### YIELDS OF ALFALFA STRAINS AT COLLEGE PARK

Yields in Tons Per Acre—Average of Two Plots

Strain	Total 1929	Total 1930	Total 1931	Average Yield Per Acre	Relative Position
Argentine .....	3.11	2.49	4.56	3.39	1
Cossack .....	2.57	2.84	4.59	3.33	2
Montana Common .....	2.63	2.57	4.71	3.30	3
Grimm (Montana) .....	2.35	2.84	4.59	3.26	4
Kansas (Scarlett) .....	2.81	2.44	4.50	3.25	5
Grimm Utah .....	2.75	2.51	4.23	3.16	6
Montana Variegated .....	2.03	2.76	4.35	3.05	7
Kansas (T. W. W.) .....	2.85	2.15	4.11	3.04	8
Northern Grown .....	2.64	2.33	4.01	2.99	9
Turkestan .....	1.48	2.32	3.84	2.55	10
Arizona .....	1.42	1.60	3.81	2.28	11

In addition to the source of seed studies, careful records are being kept on the stand in order to determine whether or not alfalfa stands become thin as a result of summer conditions or

winter killing. These records are kept on especially marked areas and the records are taken in both fall and spring. The Arizona plot was the only one to show any considerable amount of winter killing during the period of the observations.

### *Wheat:*

The following yields were obtained with two new strains of the "Leap" variety:

Strain	1928	1929	1930	1931	Ave.
Leap .....	35.9	34.4	45.9	33.2	37.4
4823-25-41 .....	37.0	38.8	55.2	36.1	41.8
4823-25-33 .....	39.0	36.6	50.6	32.0	39.6

### *Sugar Corn:*

Sugar corn yields at College Park in 1931 in tons of husked ears graded for canning and in pounds per plant:

<i>Evergreen Type—</i>	Tons per Acre	Lbs. per Plant
Local seed (2 yrs. or more in Md.)		
1. Early Evergreen .....	2.14	.65
2. Hopeland .....	2.07	.64
3. Late Evergreen .....	1.90	.62
4. Evergreen .....	1.80	.54
Average .....	1.98	.61
Out-of-State Seed (open pollinated)		
1. Evergreen (Idaho) .....	1.93	.63
2. " (Conn. 1929) .....	1.58	.52
3. " (Landreth Co.) .....	1.47	.56
4. " (Conn. 1930) .....	1.50	.57
5. Early Evergreen (Conn. 1930) .....	1.48	.49
6. Early Evergreen (Idaho) .....	1.23	.49
Average .....	1.53	.54

### *Soil Fertility, Classification and Management:*

The making of soil survey classification and maps of counties originated in Maryland and all of the counties have been covered. Due to some changes in methods and classification, several of the counties surveyed in the early years of this work had to be resurveyed in order to make them more accurate and to have the classification of the entire state uniform. The resurvey was completed this year. The value of this work is already apparent in the increased yields which are resulting from the intelligent adjusting of crop to soils and their proper fertilization.

About ten years ago the soil department in cooperation with other interests promulgated a standard list of fertilizer analyses

for various crops. The appreciation of the value of this list by consumers is indicated by the sales from this list increasing during this period from 22% to approximately 80% of the total consumption in Maryland. In addition to the better yields obtained with the analyses recommended, they have saved the farmers many thousands of dollars because of the lower unit cost of the better grades.

Preliminary studies have been started to determine the lime requirements of cluster soils and the availability of phosphorus in Maryland principal soil types.

The needs for additional land, for soil fertility and crop research, as set forth in the 44th annual report still holds and becomes more and more acute each year. This Station can not meet all its obligations to the farmers or do the work it should until sufficient *suitable* land is provided.

Projects listed in the 44th report will be continued this year except O-29, which has been completed and B-46, which is dormant.

#### *Animal and Dairy Husbandry:*

This department has published four bulletins during this year and has the results of several other projects about ready for publication. The following is a brief summary of the results presented in the bulletins:

Bulletin 330, Calf Feeding, is the second of a series of bulletins under the general heading of Calf Feeding Investigations and deals with the raising of dairy calves on a nurse cow, whole milk, remade skim milk, and home mixed calf meal. Previous work along the same line was reported in Bulletin 319. The following conclusions were drawn as a result of our observations and experiences with calf feeding work:

1. In following any minimum milk plan in raising calves, they may be weaned from milk at 45 to 60 days of age, depending on the size and vigor of the calf. To produce a satisfactory animal, small calves should not be weaned under 60 days of age.

2. The nurse cow method of raising calves is very satisfactory, and by adjusting the length of the nursing period and the amount of milk which a calf is allowed to nurse, calves may be raised at a cost nearly as low as by any method.

3. The hand-feeding of whole milk is usually not an economical method of raising calves. Other methods are not only more economical, but will produce just as satisfactory calves.

4. Calves can be raised successfully on as little as 100 pounds of whole milk and approximately 75 pounds of skim milk powder,

the entire amount of the latter need not be fed in the liquid form, but a portion may be fed dry in the grain ration.

5. Results obtained in this feeding trial further indicate that remade skim milk may be fed cold to calves with satisfactory results.

6. Calves that are large and vigorous may be raised successfully on a dry home-mixed calf meal after they have had a good start on milk for the first 45 days. Until the calf is well started, it is advisable to include some skim milk powder in such mixtures.

Bulletin 331, Contagious Abortion in the Experiment Station Dairy Herd, is a report upon the prevalence of contagious abortion in the Experiment Station herd since 1908, its effect upon milk and butterfat yield and upon the breeding efficiency of the herd, and presents a discussion of the effectiveness of methods adopted for its control.

1. Frequent agglutination tests on the negative herd along with the isolation of positive cows has proved very satisfactory to date as a method of controlling contagious abortion in the Maryland Agricultural Experiment Station dairy herd.

2. The removal of the positive cows may not solve all of the problems, but it has proven helpful and is recommended.

Bulletin 332, Oat Feed Roughage, is a report on two feeding trials with dairy heifers carried on during the winters of 1930-31 and 1931-32 in which oat feed was substituted for alfalfa hay in the ration. It was found, under the conditions of the experiment, that satisfactory daily gains were made by the oat feed and hay groups in both trials. In Trial I, the hay group made an average daily gain of .133 of a pound more per animal than those in the oat feed group. The reverse was the case in Trial II. The oat feed group in this trial made an average daily gain of .137 of a pound more per animal than those in the hay or check group.

By the use of oat feed, a saving in the cost of the roughage fed per heifer in Trial I for 120 days amounted to \$5.29 and in Trial II for 90 days to \$4.69. This made a difference of \$.03 per pound of gain in Trial I and \$.05 per pound of gain in Trial II in favor of oat feed.

The results obtained in these two feeding trials with growing heifers show that oat feed can be substituted pound for pound for hay or roughage with satisfactory results when the difference in total protein fed in the ration is balanced by the addition of cottonseed meal.

#### *Wheat as a Hog Feed:*

The results of several years' tests of feeding wheat to fattening hogs has shown the ground wheat to be more palatable than shelled corn and 5% to 10% more valuable in producing gains.

Rations of wheat and corn were improved by supplements of fishmeal. Not as much was needed with the ground wheat as with shelled corn. The amount of fishmeal should be varied with the size of the hogs and depending upon whether they are in pasture or in pens, but with hogs 100 to 150 lbs. weight, about one-third pound per day would seem to be profitable.

The results indicate that with the low prices of wheat which have obtained for several years, there is an opportunity to get a better price by feeding it to hogs and marketing it as pork. This is also very generally true of wheat which has been damaged in storage by insects.

### *Chocolate Milk:*

A patent has been granted to the University on work done by Prof. R. C. Munkwitz and Leidy D. Zern on the "Processing of Chocolate Milk Without Sedimentation", and the method of procedure is ready to be made available to the public. The commercial application of this process devised for producing a chocolate syrup from which to make chocolate milk without sedimentation remains to be further developed. A condensing pan is necessary in order that the process may be studied in its commercial aspects.

### *Electric Sterilizer for Dairy Equipment:*

This project was conducted in cooperation with the National Rural Electric Project and the Department of Agricultural Engineering. The appliance devised possessed the following features:

1. The electric hot air sterilizer is capable of efficiently sterilizing dairy utensils.
2. The utensils are dry at the completion of the sterilizing period; a condition which is very desirable.
3. There is apparently no deterioration of the utensils after continued use in the sterilizer.
4. It is simple to operate, being automatic in control, and thus eliminating the human element involved in its operation.
5. It is reasonable in first cost and economical in operating cost and upkeep.

The Animal and Dairy Husbandry work of the Experiment Station is badly handicapped for the lack of land, buildings, and other facilities for this class of work as outlined in detail in the last annual report.

There are many problems which cannot be investigated under present conditions. Projects C-4, C-7, C-8, G-3, G-4, G-6, G-7, and G-9 have been completed and discontinued. All other projects listed in the 44th Annual Report are active.

### *Bacteriology and Animal Pathology:*

This department has a variety of functions and activities. They may be classified under five heads.

1. Teaching under-graduate and graduate courses and training specialists.
2. Research by staff and graduate students on State problems.
3. Demonstration of preventative measures.
4. The making and distribution of biological preparations.
5. The diagnosis of diseases and making of specific tests and cultures.

This department has eighteen research projects in progress. Much has been accomplished on the research. Some results have been published, as shown in the list of technical papers. Other matter is nearly ready for publication.

This department, in common with many others, needs land and more laboratory space to improve its facilities and increase its efficiency.

### *Botany, Pathology, Physiology:*

This department has in progress several projects which aim to solve some of the problems met in the storage of vegetables and fruits and in preventing the deterioration of vegetables between the time of gathering and consumption.

Some very important investigations are underway on the relation of plant food deficiencies to the diseases of the tomato.

Some progress has been made on the development of disease resistance in some strains of plants. A variety of pea named "Maryland Alaska" is resistant to wilt. This variety has been multiplied and there will be approximately 1000 bushels of seed available for 1933 planting.

The studies on tomato mosaic have shown it can be prevented by the control of insects and care that healthy plants are not touched by hand, or implements after having contact with diseased plants.

Spraying and dusting tests for the control of disease on potatoes gave results in favor of spraying with a 4-4-50 Bordeaux Mixture.

Observations on Bean Anthracnose have proven that the disease winters over in this section.

The work in this department needs more greenhouse space in order to carry on many of the projects efficiently. In the development of disease resistant strains of plants, sufficient greenhouse space would enable as much to be accomplished in one year as can be gotten in three years, under ordinary conditions.

New problems are constantly arising in this field, as in other fields; but no new projects can be undertaken with the facilities available at present.

### *Entomology:*

#### I. PROGRESS AND RESULTS OF EXPERIMENTS.

##### A. *Corn Earworm*

Considerable progress has been made during the year just ended on completing the work on the field experimental phase of the corn earworm. Results of six years' work were published as Experiment Station Bulletin No. 328 in June, 1931. The results of the past summer's work on the time of infestation of corn in relation to silking were presented to the Association of Northeastern Entomologists. This work is being continued on a larger scale. The work in 1932 is mainly in the field of attractants and repellants and the value of husk characteristics in preventing the entry of the corn earworm.

##### B. *Codling Moth*

Tests of 26 combinations against the overwintering stages of the codling moth were reported in the *Journal of Economic Entomology*, Vol. 25, No. 3. In addition, the codling moth was the subject of considerable field experimentation, to determine a substitute for arsenic in late sprays. These results were reported in the *Transactions of the Peninsula Horticultural Society*.

##### C. *Oriental Fruit Moth*

The oriental peach moth studies were continued. Part of the results of this work were published in the *Transactions of the Peninsula Horticultural Society* for 1931, page 45, under the title, "Parasitism and Overwinter Control on the Peach Moth," by H. S. McConnell.

##### D. *Strawberry Leafroller Parasites*

A study of parasitism of the strawberry leafroller has been in progress for three years to determine the interrelation of the leafroller parasites and the oriental fruit moth parasites.

The strawberry leafroller has been found principally in the eastern part of the state and the studies have been confined to this portion of the state. Localities for study have been further limited to those areas where strawberries and peaches are planted close together. The study to date indicates that there is no important relation between the parasites of the oriental fruit moth and of the strawberry leafroller in Maryland.

While the study of strawberry leafroller parasites did not indicate any important relation between the parasites of the two species, the study did indicate the probable reason why the straw-

berry leafroller is a minor pest of strawberries in Maryland. The records were secured by collecting larvae in the field and breeding them out. By this method, thirty-two different species of parasites were secured, but only about six species are of any economic importance.

#### *E. A Mite Injurious to Privet*

During recent years *Phyllocoptes* sp. has been doing serious damage to privet hedges in the state. This microscopic mite begins its attack on the leaves and tender shoots soon after new growth begins in the spring. Feeding of the mites causes serious stunting of all new growth, and curling of the leaves toward the midrib. Damaged leaves become brittle and break very easily when handled.

The mites winter over on the privet plants, especially about bud scales. Tests have been conducted against the overwintering mites, using three different commercial oil emulsions. All of these oils gave good control against the mites when applied at 2% strength before new growth began.

## II. NEW PROBLEMS

A number of projects in connection with the health of man and animals that demand the attention of the department, but that cannot be met with the present budget and facilities are: mosquitoes, biting flies, the tropical rat mite, and ticks.

Plans were laid early in the spring of 1932 for a mosquito survey in cooperation with Dr. Bishopp, Chief of the Division of Insects Affecting Man and Animals, U. S. Bureau of Entomology, and traps to determine the seasonal distribution of the various species of mosquitoes will be in operation this summer.

Considerable work needs to be done on crop insects, particularly the control of tobacco pests, several truck pests, particularly the striped cucumber beetles, and the asparagus beetle, a flea beetle new to the strawberry fields of the Eastern Shore, the seed corn maggot, and in northern and western Maryland on bill bugs and the sod webworms. In addition, a general insect survey is needed to determine the fauna of the state. In connection with the establishment of the new marine biological laboratory at Solomon's Island, that region should be surveyed to supplement the other studies conducted there.

### *Home Economics Research:*

There are two projects under way in this field.

1. Farm housing in relation to labor turnover.
2. Factors affecting the food consumption habits of farming people in Maryland.

On the first project over one thousand farms in five counties were surveyed. The results are being compiled for publication.

Surveys have been made in Garrett, Harford, Anne Arundel and Dorchester Counties in connection with the second project. The results, so far as compiled, indicate that there has been some marked changes in kinds and sources of food during the last ten years.

In addition to the regular projects, this department has given some help in the nutritional surveys made by the Red Cross in connection with drought relief and in procuring some special data for the White House Conference on Child Health and Protection and the President's Conference on Home Building and Ownership.

The College of Home Economics has cooperated with the Department of Animal Husbandry in the study of factors influencing the palatability of meats and with the Department of Agronomy in the study of the use of flour made from Maryland wheats for cake.

### *Horticulture:*

1. The maintenance of annual bearing of apple trees can be assisted by pruning and fertilizer treatments. Adverse conditions, such as drought, serve to throw the trees into a biennial condition. Frost may act either adversely or beneficially in this respect.

2. Relatively slight shading of apples has a pronounced affect in reducing red color productions of the fruits. Heavy shading resulted in no red color production and a smaller sized fruit.

3. Nitrogen fertilizers are necessary to maintain good growth and high yields under most soil conditions in Maryland orchards. Fibrous roots are more concentrated in the area 0-3 feet from the trunk of the apple tree, but a far greater proportion of fibrous roots is in the area beneath the outer spread of the branches. Nitrogen applications have been most effective when the fertilizer is distributed under the outer spread of the limbs of the tree, but are also of value applied to areas closer to the trunk. Analyses of roots of apple trees, fall nitrated, show that nitrogen is taken into the roots during the winter months and stored in the larger roots.

4. A sod mulch system of apple orchard culture appears to give satisfactory results in Maryland if nitrogen fertilizers are supplied in sufficient amounts. An alfalfa sod is excellent for orchards where this crop can be grown.

5. Nitrogenous fertilizers in the spring of the fruiting year have resulted in increases in yields of strawberries, due largely

to increased size of berry. Decreased yields have also resulted from the same fertilizer when used on Missionary variety on good soils. Good yields are dependent on moisture in the soil more than on added fertilizing elements under usual conditions encountered in Maryland.

6. Pollination results obtained in orchards at Hancock, Maryland, have shown that the variety York Imperial set less than one-fourth of a commercial crop when pollinated by its own pollen. Pollen from Red Rome, Wealthy, Red Duchess, Starking, Summer Rambo, Melba, Jonathan, and Joyce all caused sufficient set on York Imperial for a commercial crop.

Red Rome was found to set well with its own pollen and the fruits remain on the tree up to the "June Drop". During the "June Drop" however a much lighter percentage of the selfed fruits abscised than in the case of cross pollinated fruits. The selfed fruits also contained fewer seeds, were smaller and were more irregular in shape than the cross pollinated fruits. It is therefore recommended that this variety be set with cross pollenizers in order to insure a commercial crop. Pollen from Starking, Golden Delicious, Jonathan, and Red Duchess caused a commercial set of fruit on Red Rome. Pollen from Yellow Transparent, McEarly and Summer Rambo was also effective in causing a good set but these varieties usually bloom too early to be effective pollenizers in the Rome orchard.

Williams was found to be self-unfruitful at College Park. Pollen from Starking, Delicious, Yellow Transparent, Golden Delicious, Wealthy and Wilson's Red June gave a satisfactory commercial set of fruit on this variety. Jonathan, however, was not a satisfactory pollenizer.

Wilson's Red June was found to be self-unfruitful. Selfed fruits, however, often remain on well up to the "June Drop," but most of them are abscised during this period. Starking, Delicious, Golden Delicious, McIntosh, Melba, and Yellow Transparent were found to be satisfactory pollenizers for this variety.

Melba, a very promising new variety of the McIntosh type, was found to be self-unfruitful. McIntosh, Wealthy and Red Duchess and Joyce all caused a heavy set of fruit on this variety.

Golden Delicious was found to be self-unfruitful on most trees. A small percentage of the more vigorous spurs, however, will set fruit when selfed, although this is far from sufficient to give a commercial crop. Starking, Delicious, Red Duchess, Grimes Golden and Red Rome were all effective pollenizers for this variety. Pollen from Melba and Early McIntosh set fruits well on Golden Delicious but their blooming season may be too early to be effective as commercial pollenizers.

Red Duchess (Daniels) was found to be self-unfruitful. McIntosh, Melba and Joyce were found to be effective pollenizers for this variety.

Starking was found to be completely self-unfruitful. Golden Delicious, Grimes, Red Duchess, Melba and Early McIntosh proved to be effective pollenizers.

Grimes Golden, which has been classified in the literature as being self-unfruitful was found to be only slightly self-fruitful. Red Duchess, Starking and Summer Rambo were found to be effective pollenizers.

Lowry was found to be readily pollenized by Starking and Golden Delicious. Selfed flowers of this variety set very poorly.

7. Fruiting of the Concord grape has a devitalizing effect on the growth of the vine under commercial conditions, but the effect of the crop is not as great as usually is supposed.

8. Light pruning of young peach trees, moderate pruning of bearing trees and rejuvenation pruning of old trees is recommendable for Maryland conditions.

9. Starking, Melba, Red Rome, Lobo, Early McIntosh and Cortland are new varieties of apples which give promise as desirable sorts under Maryland conditions.

10. Five years of study have shown that fertilizers have not affected the firmness of storage quality of apples, peaches, or strawberries.

11. Potash salts applied to orchard soils in Maryland moved down through the lighter soils, but remained in the upper six inches in heavy soils.

12. The most desirable planting distance of peach trees under present orchard conditions is an important economic problem under study.

13. New varieties of peaches, apples, pears, cherries, plums, strawberries, gooseberries, currants, raspberries, blackberries and grapes are being tested to aid the grower in his selection of varieties.

14. Breeding work to develop new varieties of fruits of better quality or season is in progress.

15. Canning varieties of peaches (cling stone varieties grown in California) have been under test in Maryland, but most of them are not promising.

16. Spring plowing is better than fall plowing for garden and canning peas.

17. The variety of cantaloupe, Hales Best, produced the largest number of prime fruits among several varieties with Benders Surprise second best.

18. Sweet potato plants grown with short root stems (one or two inch) produced more tubers and of better size and shape than plants with long root stems.

19. A sweet potato selection, now named Maryland Golden Sweet, has proved very desirable and is in big demand on the Eastern Shore.

20. Marglobe tomato made better canned product than Tri-State when these varieties were grown under heavy fertilization.

21. Moisture supply is an important factor in determining the yield of lima beans.

22. Manure plus 7-6-5 fertilizer gave much better yields of cabbage, bush potatoes, lima beans and snap beans than any fertilizer treatment with or without green manure crops. Sweet potatoes, however, responded better to a 2-8-10 fertilizer without manure.

### *Poultry:*

During the fiscal year just past, a great deal of effort was expended in reorganizing and adjusting the work of the department, as a consequence of the discontinuance of the Egg Laying Contest Project which was a major project during the previous six years. In addition, a considerable amount of time has been spent in helping poultry raisers surmount difficulties they have encountered as a result of the economic conditions. While under a strict interpretation, this type of work may not be classified as Experimental, still the demand is insistent, the poultry raisers come in with their problems, write about them, and it seems essential that research workers, at least those who have to do with organizing the work, come into intimate contact with the problems as they are met with in the field, so as to be better able to point the research to practical ends. Contacts with the poultryman who has an actual problem on his hands also assists in publishing to the world the results of research. It is a fundamental of teaching that no one pays so much attention to what is told him as one who is attempting to solve a problem that is involved in the subject under discussion. Such a situation is ideal for a perfect contact between student and instructor, and after all what is the use of practical research if it is not to get the results across to the practical man?

Much progress has been made through management and breeding in the control of White Diarrhea. Some of the results would indicate that strains of poultry may develop a certain degree of immunity or resistance to the disease.

This department has cooperated with the State Feed Control Laboratory in testing poultry feeds suspected of causing the

death of chickens. Usually the feed has not been at fault. These laboratories have also cooperated in testing the feed value of various brands of cod-liver oil and cod-liver oil substitutes.

Some work has been conducted in testing the toxicity of salt when fed to chickens. The results indicate that chickens can tolerate more salt than is usually supposed. They ate and survived rations, for 9 weeks, containing as high as 15% of salt. The best growth and development was with a ration containing only one per cent of salt.

Much attention has been given to meeting present economic conditions by the use of home mixed and home grown feed rations. The results have been satisfactory and helpful to many.

### *Seed Testing:*

An appreciation by farmers of the value of good seed as a necessity for the production of good crop is becoming more and more recognized. This has caused an increase in work of the laboratory.

There is considerable demand in some quarters to have the inspection of seeds extended so as to place vegetable seeds on the same basis as agricultural seeds. There is no doubt that market gardeners should be extended this service and protection. If vegetable seeds are to be inspected it will require additional force, equipment and maintenance expenses.

Seed stocks of agricultural seeds on sale throughout the State have been inspected and the tagging provisions of the State seed law have been found to be complied with as well as could be expected. A careful study of the 500 samples collected has shown them to be of good quality on the whole. Small lots of seed have been coming into the State from wholesale firms in the producing sections in larger numbers than normal. These lots are often not of the quality indicated by their tagging. Summaries of the work done on these samples are sent to retail dealers, farmers, and county agents with the idea of pointing out the reliability of the tagging of the wholesale dealers who supply the Maryland market. The cumulative effect of these summaries is good in that they persistently show those dealers who tag their seeds accurately and dependably.

During the last two or three years the number of samples sent to the laboratory has increased until this class of work takes more time than any other. We have cleaned large numbers of lots of tobacco seed during the past year with much favorable comment from many tobacco growers. More of our State institutions are sending their seeds for testing than in previous years. This is particularly helpful because of the fact that these seeds are bought on the basis of competitive bids.

In addition to work with collected and submitted samples of seeds some cooperative work with other laboratories and research work has been done. This work is essential to a first class laboratory because of the fact that seed testing is constantly changing and all of the personnel must be trained in new and improved methods. Over two hundred specimens have been added to the seed collection.

Prof. Holmes attended the International Seed Testing Congress in Wageningen, Holland, in 1931. He gained many useful ideas and helpful contacts. Out of deference to our American laboratories he was named chairman of the sampling committee of the International Seed Testing Association. This committee has undertaken a comprehensive study of the taking of the "working sample". Such a fundamentally important problem will interest laboratories throughout the world and must necessarily place our laboratory before the seed testing world.

### *Muskrat Investigations:*

This project was started in December, 1930. It is carried on cooperatively by the State Conservation Commission, the U. S. Department of Agriculture and this Station. The work is being conducted at Church Creek, Dorchester County, Maryland.

The work has been slow as it requires time and patience to learn the living, feeding, and breeding habits of wild animals and conduct tests under semi-wild conditions. Much progress has been made and knowledge gained on the habits of these little animals which contribute a source of meat and fur which has an annual value of one to three millions of dollars. It is hoped that the marsh lands of Maryland can be made to yield a still greater return from this source.

The drought of 1930 caused a loss of food for muskrats and as a consequence, many died and there was a small increase in young.

At the present time it is unadvisable to attempt to raise muskrats in pens or captivity for profit as the pens and food are too expensive and the animals breed too slowly. Some animals are much more prolific than others. It may be possible to develop a prolific strain and secure a cheaper and more abundant source of food so that muskrats may be raised in captivity at a profit. Pens should be located on high ground which provides good drainage and sanitation at the same time where water and food is accessible.

## FINANCIAL RESOURCES AND EXPENDITURES

The Experiment Station is maintained by Federal and State appropriations, by sales of farm products and small contributions from time to time for special pieces of research.

The Federal acts outline the functions and lines of work to be undertaken. The State appropriations are for the most part for general and executive expenses and supplementary to the Federal acts.

The Biological Laboratory and Seed Inspection funds are used largely for regulatory work and can not be strictly classed as research funds.

The following table gives the details as to the appropriations and expenditures:

MARYLAND AGRICULTURAL EXPERIMENT STATION  
IN ACCOUNT WITH  
UNITED STATES APPROPRIATION

Dr.	Hatch Fund	Adams Fund	Purnell Fund
To appropriations for fiscal year, 1931-1932 .....	\$15,000.00	\$15,000.00	\$60,000.00
Cr.			
By Salaries .....	\$14,995.00	\$14,433.35	\$46,114.91
Labor .....			6,048.68
Stationery and Office Supplies.....		2.30	101.14
Scientific Supplies .....		243.28	969.83
Sundry Supplies .....		3.57	541.19
Fertilizer .....			513.55
Communication Service .....	5.00		1.39
Travel .....		118.65	3,673.28
Transportation of Things.....			10.98
Publications .....			4.50
Heat, Light, Water & Power.....			7.23
Furniture, Furnishings & Fixtures .....			178.55
Library .....			18.69
Scientific Equipment .....		8.00	1,497.21
Livestock .....		190.85	76.76
Tools, Machinery and Appliances...			219.79
Buildings and Land.....			22.32
Totals.....	\$15,000.00	\$15,000.00	\$60,000.00

MARYLAND AGRICULTURAL EXPERIMENT STATION  
IN ACCOUNT WITH  
THE STATE APPROPRIATIONS

	General Fund	Ridgely Farm
Dr.		
Balance June 30, 1931.....		\$ 49.42
Receipts for year 1931-1932.....	\$63,055.11	4,702.08
Total .....	\$63,055.11	\$4,751.50
Cr.		
By Salaries .....	\$28,539.88	\$1,965.00
Labor .....	15,149.66	1,957.80
Stationery and Office Supplies.....	219.94	
Scientific Supplies .....	354.30	
Feeding Stuffs .....	5,727.17	49.00
Sundry Supplies .....	1,681.24	334.68
Fertilizers .....	1,115.35	116.34
Communication Service .....	159.75	27.45
Travel Expenses .....	1,218.52	166.82
Transportation of Things.....	1,377.37	3.55
Publications .....	1,359.11	
Heat, Light, Water and Power.....	1,547.42	
Furniture, Furnishings and Fixtures.....	95.62	24.00
Library .....	396.19	
Scientific Equipment .....	156.45	
Livestock .....	145.00	
Tools, Machinery and Appliances.....	1,327.25	210.80
Buildings and Land.....	2,196.96	100.00
Contingent .....	2,301.29	47.34
Total .....	\$65,068.47	\$5,002.78
Overdraft June 30, 1931.....	3,852.77	
	\$68,921.24	\$5,002.78
Overdraft June 30, 1932.....	*5,866.13	*251.28
	\$63,055.11	\$4,751.50

\* Due from State Treasurer.

MARYLAND AGRICULTURAL EXPERIMENT STATION  
IN ACCOUNT WITH  
THE STATION FARM FUND

Dr.	
Receipts 1931-1932 .....	\$18,526.39
Total .....	<u>\$18,526.39</u>
Cr.	
By Salaries .....	\$ 2,691.74
Labor .....	11,177.56
Stationery and Office Supplies.....	8.90
Scientific Supplies .....	132.49
Feeding Stuffs .....	289.22
Sundry Supplies .....	315.50
Fertilizers .....	30.95
Communication Service .....	7.50
Travel Expenses .....	225.32
Transportation of Things.....	1.00
Publications .....	185.00
Heat, Light, Water and Power.....	128.72
Furniture, Furnishings and Fixtures.....	348.85
Scientific Equipment .....	294.08
Livestock .....	6.50
Tools, Machinery and Appliances.....	119.12
Muskrat Investigation .....	1,123.56
Contingent .....	104.62
Total .....	<u>\$17,190.63</u>
Overdraft June 30, 1931.....	2,653.88
	<u>\$19,844.51</u>
Overdraft June 30, 1932.....	1,318.12
	<u>\$18,526.39</u>

MARYLAND AGRICULTURAL EXPERIMENT STATION  
IN ACCOUNT WITH  
REGULATORY AND PUBLIC SERVICE FUNDS

	Biological Laboratory	Seed Inspection	State Dairymen's Association
Dr.			
Balance June 30, 1931.....	\$ 4,372.96		
Receipts for year 1931-1932.....	12,972.19	\$10,510.65	\$2,835.12
Totals .....	\$17,345.15	\$10,510.65	\$2,835.12
Cr.			
By Salaries .....	\$ 6,588.51	\$ 8,845.02	\$2,075.00
Labor .....	1,254.01		
Stationery and Office Supplies.....	59.85	221.18	
Scientific Supplies .....	344.42	239.96	
Feeding Stuffs .....	1,036.93		
Sundry Supplies .....	1,427.88	115.10	
Fertilizer .....	6.50		
Communication Service .....	453.13	145.20	
Travel Expenses .....		632.62	535.12
Transportation of Things.....	86.88	11.97	
Heat, Light, Water and Power.....	395.93		
Furniture, Furnishings & Fixtures .....		64.50	
Library .....		11.89	
Scientific Equipment .....	412.34	247.72	
Tools, Machinery and Appliances.....	75.00		
Buildings and Land.....	5.69		
Contingent .....	2,582.92	14.00	
Total .....	\$14,729.99	\$10,549.16	\$2,610.12
Overdraft June 30, 1931.....		721.75	225.00
		\$11,270.91	\$2,835.12
Overdraft June 30, 1932.....		760.26*	
	\$14,729.99	\$10,510.65	\$2,835.12**
Credit Balance June 30, 1932.....	2,615.16		
	\$17,345.15		

\* Due from State Treasurer.

\*\* For 3 months only—Transferred to Extension Service Oct. 1, 1931.



